Cont A2

adjacent to each other, the four patterns are exposed such that corner portions of the four patterns are superposed on each other, with exposure amounts of the corner portions of the four patterns being respectively set based on a characteristic obtained by multiplying a first characteristic which gradually decreases outward along the first direction by a second characteristic which gradually decreases outward along the second direction when respectively exposing the four patterns.

Page 6, line 20 to page 7, line 13, delete current paragraph and insert therefor:

A3

The present invention provides a second exposure method which stitches and exposes a plurality of patterns on a substrate, thereby exposing a larger pattern than each of the patterns on the substrate, wherein a plurality of patterns are stitched and exposed such that partial regions of the patterns are superposed on each other in a first direction and a second direction which intersect with each other, and, in a region in which four patterns are adjacent to each other, of a first pair of the patterns and a second pair of the patterns which are obliquely opposed to each other, the first pair of patterns are exposed with respective rectangular corner portions of the first pair of the patterns being superposed on each other and the second pair of patterns are exposed with corner portions of respective triangles of the second pair of patterns being provided adjacently to each other in the rectangular corner portions.

Page 7, lines 14-24, delete current paragraph and insert therefor:

A4

According to the above-mentioned present invention, the corner portions of the three adjacent patterns are superposed and exposed in one of the triangular regions in a region where the four patterns are provided adjacently to each other, and the corner portions of the three adjacent patterns are superposed and exposed in the other triangular region. In the corner portions, the amounts of exposure are decreased outward with predetermined characteristics, respectively. Therefore, the amount of integral exposure is almost equal to the amounts of integral exposure in other portions.

Page 8, lines 1-23, delete current paragraph and insert therefor:

Next, the present invention provides a first exposure apparatus which transfers a pattern of a mask onto a substrate, comprising an illumination optical system which illuminates the mask, a field stop which is disposed at a substantially conjugate position with respect to a pattern plane of the mask in the illuminating optical system and which serves to set an illuminating region on the mask, a substrate stage which positions the substrate, and a beam attenuating filter which is provided on a plane in proximity to the pattern plane of the mask a conjugate plane with respect to the pattern plane or a plane in proximity to the conjugate plane, and which serves to set a transmittance for illumination light for exposing a region corresponding to at least one corner portion of a pattern region having an external shape substantially parallel with a first direction and a second direction, which intersect each other, of the pattern plane based on a characteristic obtained by multiplying a first characteristic which gradually decreases outward along the first direction by a second characteristic which gradually decreases outward along the second direction. By the exposure apparatus, the first exposure method according to the present invention can be used.

A5

Page 8, line 24 to page 9 line 23, delete current paragraph and insert therefor:

Moreover, the present invention provides a second exposure apparatus comprises a beam attenuating filter having the following characteristic in place of the beam attenuating filter of the first exposure apparatus. More specifically, the beam attenuating filter serves to set, of first and second pairs of corner portions, which are opposed obliquely to each other, of a pattern region having an eternal shape substantially parallel with a first direction and a second direction, which intersect each other, of the pattern plane, a transmittance for illumination light for exposure in a region corresponding to the first pair of corner portions based on a first characteristic which gradually decreases outward along the first direction or a second characteristic which gradually decreases

A6

outward along the second direction, and to set a transmittance for illumination light for exposure in a region corresponding to a second pair of corner portions, in a triangular region expanded outward along an opposed direction of the pair of corner portions, based on a characteristic obtained by adding the first characteristic which gradually decreases outward along the first direction and the second characteristic which gradually decreases outward along the second direction. By the second exposure apparatus, the above-mentioned second exposure method can be used.

Cont A6

Page 16, line 5 to page 17, line 2, delete current paragraph and insert therefor:

A7

Fig.1 is a view showing a schematic structure of a projection exposing apparatus to be used in an example of an embodiment of the present invention. Fig.2 is an enlarged view showing an example of the structure of a reticle blind 4 in Fig.1. Fig.3 is an enlarged perspective view showing the structure of a movable stage of a positioning device 5 in Fig.1. Figs.4A to 4C are diagrams showing transmittance distribution of a density filter 55 in Fig.1. Fig.5 is a diagram showing a projected image obtained by carrying out a transfer while performing a screen stitch by using the density filter 55 in Fig.4A. Fig.6 is a diagram illustrating a method of removing an incomplete portion through the reticle blind. Figs.7A to 7D are diagrams showing the transmittance distribution of a density filter 56 according to another example of the embodiment of the present invention. Fig.8 is a diagram showing a projected image obtained by carrying out a transfer while performing a screen stitch by using the density filter 56 in Fig.7A. Fig.9 is a view showing a main part of the embodiment in which a thin film for dustproof is provided in the density filter 55, a part of which is taken away.

Page 29, lines 2-22, delete current paragraph and insert therefor:

A8

Fig.4A is a diagram showing the transmittance distribution of the filter portion of the density filter 55. In Fig.4A, directions corresponding to the X and Y directions in Fig.1 are set to be x and y directions, respectively. Moreover, a grating pattern formed in the filter

portion of the density filter 55 is virtually drawn to indicate coordinates. Actually, a transmittance in the filter portion is substantially changed continuously between 1 (100%) and 0 (0%). More specifically, a large number of very fine dot patterns are formed in the filter portion to obtain a desirable transmittance distribution by changing the size and density of each dot pattern depending on positions. A transmission substrate itself for the density filter 55 has a transmittance of 1. Moreover, it is desirable that the size and density of the dot pattern should be regulated to set a transmittance distribution thereof to obtain a desired distribution of the amount of illuminating light on the reticle or the wafer in consideration of diffracted light generated from the dot pattern and the optical characteristics (distortion and the like) of the illuminating optical system.

Cont A8

Page 30, line 14 to page 31, line 1, delete current paragraph and insert therefor:

A9

In the rectangular filter portion of the density filter 55 in Fig.4A, the widths of stitch portions (superposed portions) 55a and 55b of both ends in the x direction which are superposed and exposed when carrying out stitch exposure are represented by a, the widths of stitch portions (superposed portions) 55c and 55d of both ends in the y direction are represented by b, and the widths in the x and y directions of an internal region surrounded by the stitch portions 55a to 55d are represented by a_0 and b_0, respectively. Moreover, the range in the x and y directions of the filter portion is as follows when the lower left apex of the rectangular filter portion is set to be an origin in the positions x and y.

Page 32, line 9 to page 33, line 5, delete current paragraph and insert therefor:

A10

In this case, a transmittance TA_1 in a region (A1) to be a rectangular corner portion in the lower left part of the filter region has a distribution obtained by multiplying a distribution (x/a) for a one-dimensional outward reduction in the x direction by a distribution (y/a) for one-dimensional outward reduction in the y direction. Moreover, transmittances TA_3, TA_7 and TA_9 in the areas of lower right, upper left and upper right rectangular corner portions in the filter region have the distribution obtained by multiplying the distribution for a one-

dimensional outward reduction in the x direction by the distribution for one-dimensional outward reduction in the y direction, respectively. Furthermore, the transmittance T in a region provided along a BB line in Fig.4A is linearly changed from 0 to 1 (100%) with respect to a position x corresponding to a variation in the position x from 0 to a as shown in Fig.4B. Similarly, the transmittance T in a region provided along a CC line in Fig.4A is linearly changed from 0 to 1 (100%) with respect to a position y corresponding to a variation in the position y from 0 to b as shown in Fig.4C.

Cont A10

Page 33, lines 6-24, delete current paragraph and insert therefor:

In the present example, the pattern of the reticle R in Fig.1 is illuminated through the density filter 55 having the transmittance distribution of Fig.4A and the reduced image of the pattern is exposed to a part in one shot region on the wafer W. Then, the reticle on the reticle stage 21 is sequentially exchanged with another reticle and the wafer W is stepped by a predetermined amount through the wafer stage 25. Thereafter, the pattern of the reticle thus exchanged is illuminated through the density filter 55 and the reduced image of the pattern is exposed to another portion in the shot region on the wafer W so that regions (which are also referred to as "stitch portions") corresponding to the stitch portions 55a to 55d in Fig.4A in the adjacent reduced images are superposed and exposed. Thus, the reduced images of the patterns of the reticles in the shot region on the wafer W are transferred while carrying out a screen stitch in the X and Y directions. The amount of integral exposure which is almost uniform is given over the whole shot region by using the density filter 55.

A11

Page 34, lines 1-23, delete current paragraph and insert therefor:

Fig.5 shows a large projected image exposed to one shot region on the wafer W in Fig.1 by the exposure carrying out the screen stitch in the present example. In Fig.5, rectangular projected images 30A, 30B, 30C and 30D constituted by the reduced images of the patterns of different reticles are exposed with stitch portions 30AB and 30CD in a boundary portion in the X direction and stitch portions 30AC and 30BD in a boundary

A12

Cont A12

portion in the Y direction superposed double, respectively. In a rectangular stitch portion 31 in which four projected images 30A to 30D are provided adjacently to each other, furthermore, the rectangular corner portions of the four projected images 30A to 30D are superposed fourfold and exposed. In this case, if the rotation error of the density filter 55 in Fig.4A and the reticle on the reticle stage 21 in Fig.1 is not completely eliminated by the positioning device 5, it is preferable that the reticle stage 21 should be rotated to set off the rotation error and the coordinate system of the wafer stage 25 should be corrected by the rotation error, and the wafer W should be stepped obliquely based on the corrected coordinate system. Consequently, the error (dose error) of the amount of exposure in the stitch portion can be reduced.

Page 35, lines 5-18, delete current paragraph and insert therefor:

A13

Description will be given to the fact that the amount of integral exposure in the stitch portions 30AB, 30BD, 30CD, 30AC and 31 is 100%. For simplicity of the description, a projecting magnification from the density filter 55 in Fig.4A to the wafer W in Fig.5 is set to 1, and the widths of the stitch portions 30AB and 30CD in the X direction are represented by a and the widths of the stitch portions 30BD and 30AC in the Y direction are represented by b. Moreover, if a point P3 in Fig.5 is taken as an origin of coordinates (X, Y) and the coordinates of a point P with the point P3 to be the origin are (X, Y), coordinates (X_A, Y_A), (X_B, Y_B), (X_C, Y_C) and (X_D, Y_D) are as follows when the lower left portions of the projected images 30A, 30B, 30C and 30D are set to be origins.

Page 38, line 17 to page 39, line 2, delete current paragraph and insert therefor:

A14

By equations (15) to (19), it is apparent that the amount of integral exposure of 100% can be obtained uniformly in the whole regions after the stitch exposure including the rectangular stitch portion 31 in which the four projected images 30A to 30D are adjacent to each other by using the density filter 55 in Fig.4A. Subsequently, a circuit pattern having a uniform line width is formed in each shot region on the wafer W through the steps of

Cont A14

development, etching, resist separation and the like. By repeating the step of forming a circuit pattern, a semiconductor device having a large area and high function can be mass produced.

Page 43, line 18 to page 44, line 11, delete current paragraph and insert therefor:

A15

Next, another example of the preferred embodiment of the present invention will be described with reference to Figs.7A to 7D and 8. Also in the present example, the projected images of a plurality of reticle patterns are exposed onto a wafer while carrying out a screen stitch by using a projection exposing apparatus having basically the same structure as that of the projection exposing apparatus shown in Fig.1. The present example is different in that the density filter 56 in Fig.7A is used in place of the density filter 55 in Fig.1 (Fig.4A). In addition, the structures according to the above-mentioned embodiments including variants and the like can be applied. In Figs.7 and 8, portions corresponding to those of Figs.4 and 5 have the same reference numerals respectively, and description will be given to the distribution of the transmittance of the density filter 56 and the distribution of the amount of exposure which is obtained by carrying out the exposure while performing a screen stitch.

Page 44, lines 12-23, delete current paragraph and insert therefor:

A16

Fig.7A shows the filter portion of the density filter 56 in the present example. In Fig.7A, the widths of stitch portions 56a and 56b of both ends in the x direction which are superposed and exposed when carrying out stitch exposure are represented by a, the widths of stitch portions 56c and 56d of both ends in the y direction are represented by b, and the widths in the x and y directions of an internal region surrounded by the stitch portions 56a to 56d are represented by a_0 and b_0, respectively. Moreover, the range in the x and y directions of the filter portion is as follows when the lower left apex of the rectangular filter portion is set to be an origin in the positions x and y.

Page 46, lines 7-18, delete current paragraph and insert therefor:

In this case, a transmittance TB_1 in a region (B1) to be the corner portion of a triangle in the lower left part of the filter region is set based on a value obtained by adding a distribution (x/a) for a one-dimensional outward reduction in the x direction and a distribution (y/a) for a one-dimensional outward reduction in the y direction. As shown in Fig.7D, a transmittance T along a line DD in the region (B1) is linearly decreased outward along a position y' in an oblique direction. A transmittance TB11 in a region (B11) of the corner portion of a triangle in the upper right part of the filter region is also set symmetrically with the transmittance TB_1.

A17

Page 46, line 19 to page 47, line 11, delete current paragraph and insert therefor:

Moreover, the rectangular corner portion in the lower right part of the filter region is divided into adjacent triangular regions (B3) and (B4), and corresponding transmittances TB_3 and TB_4 have a distribution for a one-dimensional outward reduction in the y direction and a distribution for a one-dimensional outward reduction in the x direction, respectively. Similarly, the rectangular corner portion in the upper left part of the filter region is also divided into adjacent triangular regions (B8) and (B9), and corresponding transmittances TB_8 and TB_9 are set to be symmetrical with the transmittances TB_4 and TB_3. Moreover, the transmittance T in a region provided along a BB line in Fig.7A is linearly changed from 0 to 1 (100%) with respect to a position x as shown in Fig.7B and the transmittance T in a region provided along a CC line in Fig.7A is linearly changed from 0 to 1 (100%) with respect to a position y as shown in Fig.7C.

A18

Page 47, lines 12-17, delete current paragraph and insert therefor:

Also in the present example, the reticle on the reticle stage 21 in Fig.1 is illuminated through the density filter 56 having the transmittance distribution of Fig.7A and the reduced image of the pattern of the reticle is exposed to a shot region on the wafer W while carrying out a screen stitch.

A19